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IV CONVEGNO INTERNAZIONALE E INTERDISCIPLINARE
SU IMMAGINI E IMMAGINAZIONE
4th INTERNATIONAL AND INTERDISCIPLINARY CONFERENCE
ON IMAGES AND IMAGINATION

IMG23

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A cura di / Edited by
Stefano Brusaporci, Pamela Maiezza, Adriana Marra
Ilaria Trizio, Francesca Savini, Alessandra Tata



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Atti del IV Convegno Internazionale e Interdisciplinare
su Immagini e Immaginazione

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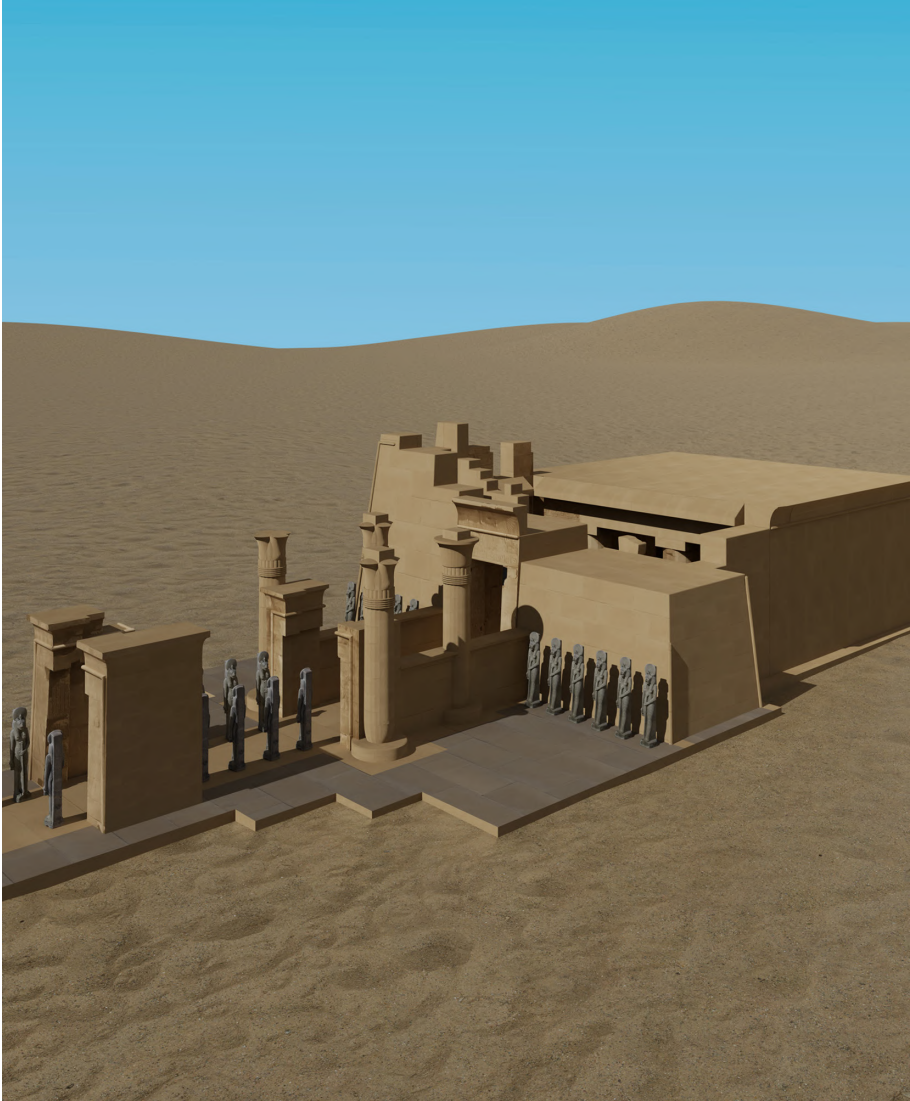
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**IMAGIN(G)
HERITAGE**



Connecting objects, times and places: Digital VR re-contextualization of the standing Sekhmet statues in the Museo Egizio, Turin, from the Temple of Ptah at Karnak

Abstract

The experience described in this paper concerns the reconstruction of the temple of Ptah at Karnak with the aim to check and present two hypotheses for the original placement of statues of the goddess Sekhmet now kept at the Museo Egizio, Turin. The reconstruction including the statues, enjoyable through virtual reality, highlights its potential as a tool for scientific debate and as a means of interactive presentation of knowledge content for the public.

Keywords

Digital reconstruction, Virtual reality, Immersive environments, Museo Egizio Turin, Temple of Ptah at Karnak.

INTRODUCTION

The Museo Egizio, Turin, preserves one of the largest collections of seated and standing statues of the goddess Sekhmet dating back to 1390-1350 BCE. Originally, they all seem to have been set up in the mortuary temple of king Amenhotep III in Western Thebes. Archival records show that the standing Sekhmet statues were, however, found in the temple of Ptah at Karnak in 1818. Since there is no archaeological documentation, their disposition in the Ptah temple is difficult to reconstruct. Thanks to the collaboration between the Museo Egizio, Turin, the Architecture and Design and the Control and Computer Engineering departments of the Politecnico di Torino as well as the VR@POLITO Laboratories, an interdisciplinary research project was initiated with the aim to digitally reconstruct the setting of the standing Sekhmet statues in the Ptah temple. Due to the lack of accurate data on their place of installation or discovery, a digital 3D model of the temple has been created to test different hypotheses of their local set-up. The results of the reconstructions are visualized and presented through an immersive VR experience that allows both scholars and visitors to explore the site. The experience creates new connections between past and present as well as the museum and the archaeological site, fueling scholarly debate and the public's interest.

DIGITAL CONTINUUM, CULTURAL HERITAGE SITES AND MUSEUMS

In the Digital Humanities, studies of heritage sites and museum collections are embracing digital-based ways of representation, communication, and interpretation. A common key element is the adoption of a trans-historical and trans-medial approach on cultural heritage objects and sites for knowledge transfer, visualization, and dissemination (Burdick et al., 2016).

This so-called "digital continuum" – in which form and information merge and a continuity between space and time is created – provides the framework for a new design logic (Continuum.Codes, 2023). The integrated digital design space opens several opportunities also in the field of Cultural Heritage which allow for the synchronous representation of time and space. This new logic also affects museums for whom the digital transition is transforming approaches to study and dissemination.

Additionally, the interoperability of digital 3D reconstructions enables different users to see, interpret and verify reconstruction hypotheses developed by digital humanists with different skills and competencies including, but not limited to, 3D modelling, archaeology, architecture, computer sciences, and visual communication (Rheams et al., 2018). Captured Reality (CR) techniques and computer-generated 3D models are used worldwide in, e.g., the "Turku Åbo 1827" project which offers an immersive virtual reconstruction of Finland's former capital and provides interactive experiences along with an edutainment approach (Turku Åbo 1827, n.d.), the digital 3D reconstruction of the "Wanfanganhe" pavilion of the Yuanmingyuan Palace, Beijing's ancient summer palace (Chen & Del Blanco Garcia, 2022), the Argentinian project "Digitalización de bienes culturales mediante imágenes 3D" (Morita & Bilmes, 2018), or the exhibition "Krause. Vestigios disponibles" that took place in 2017 at the *Museo Provincial de Bellas Artes Emilio Pettoruti* in Buenos Aires (Loaiza et al., 2020).

VR AND MUSEUMS

Museums are open, accessible and inclusive institutions that research, collect, conserve, interpret and exhibit intangible and tangible heritage for education, enjoyment, reflection and knowledge sharing

(ICOM, 2022). This mission considers the concept of the so-called new museology (Vergo, 1997). According to this concept, museums shall evolve from elementary exhibitions to enticing experiences which are able to foster visitor engagement and participation (Vergo, 1997). In this context, several cutting-edge technologies have been explored. Among them, Virtual Reality (VR) has been acknowledged as one of the most fruitful and promising ones (Bekele et al., 2018). So far, museums used VR as a way to interact in alternative form with their visitors (Bekele et al., 2018) to deliver engaging, interactive, and immersive experiences in the frame of museum learning (Carrozzino & Bergamasco, 2010) and allowing visitors to access lost or damaged historical spaces (tom Dieck et al., 2019) or artifacts (Gonizzi Barsanti et al., 2015) by digitally reconstructing them. For museums, the aspect of accessibility is particularly important in exploring lost sites or bringing objects and historical characters back to life (tom Dieck et al., 2019).

As it is possible to recreate any sort of virtual environments from scratch with VR, museum professionals have explored the potential to curate fully virtual exhibitions to be appreciated detached from the museum's premises (Bekele et al., 2018). Albeit this approach represents a way to attract people to visit the real exhibition, it has been considered more as complementary than a replacement (Vergo, 1997). Successful integrations of VR experiences supporting visitors in experiential learning typical of museums exist (Carrozzino & Bergamasco, 2010).

Digital reconstruction and VR have been also exploited from the perspective of heritage protection and conservation and as a tool to assist archaeologists in restoration measures or to reduce the cost associated to on-site campaigns (Bekele et al., 2018). In fact, VR can enable scholars to virtually restore too fragile artifacts, giving them the possibility to study these objects, or even entire sites (Bekele et al., 2018), in a surrogate and immersive way.

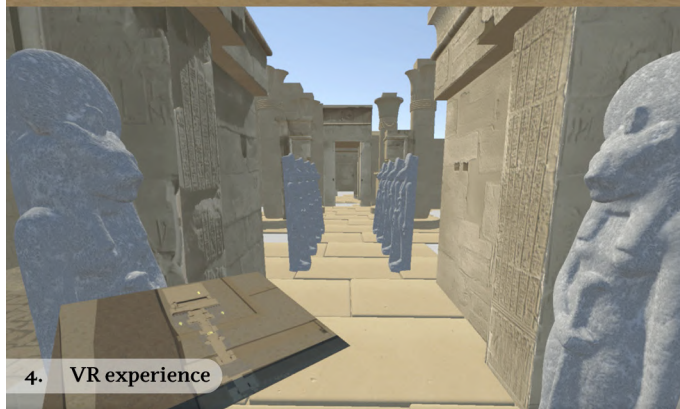
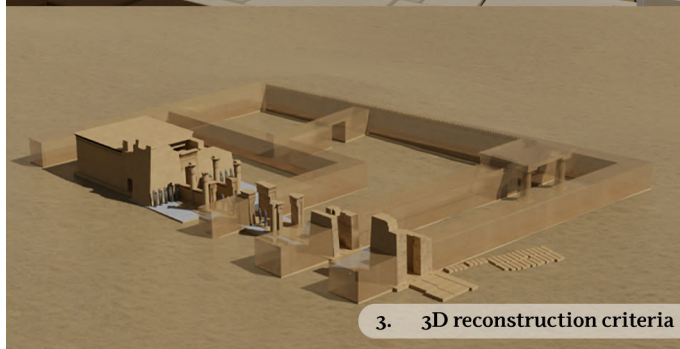
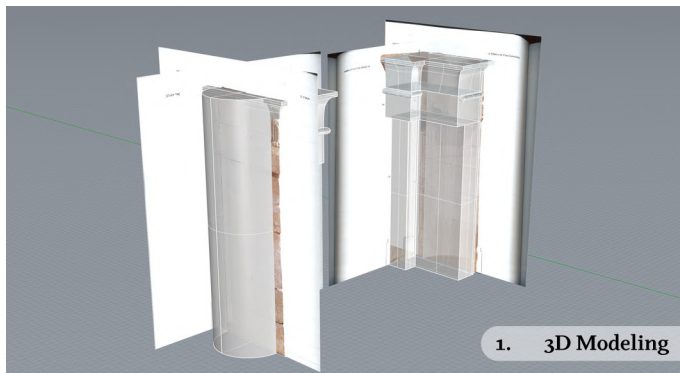
THE PTAH-TEMPLE OF KARNAK, 3D RECONSTRUCTION AND VIRTUAL SPACE FRUITION

The first phase of creating the VR experience comprised of the gathering of all available data for the digital 3D reconstruction of the temple of Ptah and its immediate surroundings. In addition, different hypotheses about the positioning of the 11 Sekhmet statues were discussed. In this regard, the history of the Ptah temple and the history of archaeological research at this site were studied (Thiers & Zignani, 2011; 2013) to have all relevant data ready at hand (fig. 1).

Using the software Rhinoceros, a digital reconstruction of the Ptah temple in its current state was created. Architectural plans, sections and illustrations were taken from a recent publication (Biston-Moulin & Thiers, 2016) in order to obtain the correct dimensions of the structural elements of the temple. The 3D modeling of the surroundings (precinct walls, other buildings and sand dunes) was done in the software Blender, which offers the best control for modeling fluid geometries.

The following steps concerned the hypothesis about the positioning of the 11 Sekhmet statues in the temple complex. According to J.-J. Rifaud's report (Cincotti, 2013), the statues were found in 1818 in front of the façade of the Ptah temple. Their arrangement was not recorded, but evidence from other temples allows to approach this issue methodologically. Two options can be discussed: the Sekhmet statues were either aligned along the façade of the temple pylon or placed side by side in two rows along the main outer temple axis in front of the pylon. These two dispositions are both included in the 3D model together with the representation of one other Sekhmet statue which was found by G. Legrain in the southern chapel of the temple in 1901/2 (Cincotti, 2013).

Fig. 1 - Pipeline of the reconstruction and VR visualization of the temple of Ptah with the placement of the Sekhmet's. Editing by Martina Rinascimento.



The creation and application of textures was a crucial and significant step as it offers a photorealistic appearance of the temple and its relief decoration. Published photographs of the decoration (Biston-Moulin & Thiers, 2016) were used as both color and normal maps to be applied to the 3D model in Blender (fig. 2).

For embedding the Sekhmet statues, existing textured 3D models provided by Museo Egizio were used. In accordance with the London Charter (2009) and the Principles of Seville (2012), representational choices were put in place to consistently distinguish between original and reconstructed parts of the temple. To graphically differentiate the original structures from the reconstructed ones, a recent graphic reconstruction of the site (Rondot, 2022, 256-257) was used and two looks with different transparency degrees were set: opaque elements represent the in-situ parts, whilst transparent ones stand for missing elements. The original flooring of the central axis has been distinguished from the restored areas using different tints: the



Fig. 2 - *Reconstruction of the temple of Ptah and texturing. Perspective view. Modelling and rendering by Martina Rinascimento.*

original parts have a warmer tone while the new parts are rendered in a colder one.

The VR experience created aims at communicating the architectural development of the temple in tandem with the research and hypotheses underlying the placement of the 11 statues. The software Unity as well as Bolt, a tool of visual scripting, were used to program the interaction between visitors and the contents of the experience. Due to the immersiveness of the VR experience, the visor Oculus Quest Meta 2 must be worn.

The VR experience is composed of two interactive moments. The first includes the appearance of the architectural elements of the temple in relation to their dating, while a voice narrates the temple's evolution through time. The voice also informs the visitors how they can move in the temple through a map of the building and a teleportation tool. Through light beams from the viewer's controller, the visitor can freely explore the digital reconstruction. As regards the possible inclusion of the experience in a museum setting, a large room is not necessary for the experience to be successful.

The second interactive moment takes place throughout the visitors' exploration of the temple when they interact with pulsating icons positioned at significant points. Having approached the icon, a narrating voice shares additional information about the god Ptah and the myth of Sekhmet, the events that led to the statues being moved from their original site to the temple, the archaeological excavations, and the research that forms the basis of the two hypotheses about the placement of the statues (fig. 3).

Each icon activates one of the two possible dispositions of the statues, and while entering the south chapel, the visitor finds the last icon that presents the statue of Sekhmet found during the archaeological excavations and now preserved in situ.

CONCLUSIONS

Reconstructive modelling combined with immersive (re-)presentation offers significant heuristic, interpretive and communicative potential. The reconstruction of the temple complex constituted a true experimental and experience-based laboratory within which the Sekhmet statues could be visualized in their different possible locations, providing new research and dissemination insights. The experience generates multi-layered links between the museum, the objects, and their find spots, resulting in entertaining and informative experiences in all relevant settings.

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Fig. 3 - Visualization of one hypothesis for the placement of the Sekhmet statues side by side in two rows along the main outer temple axis. Perspective view. Modelling and rendering by Martina Rinascimento.



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